We Claim:

1. A method for forming multilevel wiring interconnects in an integrated circuit assembly, comprising:

forming a number of multilayer metal lines separated by a number of air gaps above a substrate;

forming a silicide layer on the number of multilayer metal lines;

oxidizing the silicide layer; and

depositing a low dielectric constant insulator to fill a number of interstices between the number of multilayer metal lines.

2. The method of claim 1, wherein forming a number of multilayer metal lines includes a first conductor bridge level.

3. The method of claim 1, wherein forming a silicide layer on the number of multilayer metal lines includes using pyrolysis of a dilute silane ambient at a temperature of approximately 325 degrees Celsius.

4. The method of claim 3, wherein oxidizing the silicide layer includes using a plasma anodization process in an oxygen plasma in order to form a passivating layer for hermetic sealing of the number of multilayer metal lines.

5. The method of claim 1, wherein depositing a low dielectric constant insulator to fill a number of interstices between the number of multilayer metal lines includes depositing a low dielectric constant insulator in a single step.

6. A method for forming multilevel wiring interconnects in an integrated circuit assembly, comprising:

forming a number of multilayer metal lines separated by a number of air gaps above a substrate;

forming a silicide layer on the number of multilayer metal lines;

nitriding the silicide layer; and

depositing a low dielectric constant insulator to fill a number of interstices between the number of multilayer metal lines.

7. The method of claim 6, wherein forming a number of multilayer metal lines includes a first conductor bridge level.

8. The method of claim 6, wherein forming a silicide layer on the number of multilayer metal lines includes using a pyrolysis of silane in the presence of a dopant in order to form a lightly doped silicide layer.

9. The method of claim 8, wherein nitriding the silicide layer includes using a plasma anodization process in a nitrogen plasma in order to form a passivating layer for hermetic sealing of the number of multilayer metal lines.

10. The method of claim 6, wherein forming the number of multilayer metal lines includes forming a number of metal lines selected from the group consisting of Aluminum, Copper, Silver, and Gold.

11. The method of claim 6, wherein forming the number of multilayer metal lines includes forming the number of multilayer metal lines using electroless plating.

12. A method for forming multilayer wiring interconnects in an integrated circuit assembly, comprising:

forming a number of multilayer Copper metal lines separated by a number of air gaps above a substrate;

forming a silicide layer on the number of multilayer Copper metal lines;

oxidizing the silicide layer; and

depositing a low dielectric constant insulator to fill a number of interstices between the number of multilayer Copper metal lines.

13. The method of claim 12, wherein forming a silicide layer on the number of multilayer metal lines includes using a pyrolysis of silane at a temperature of between 300 and 500 degrees Celsius in the presence of a dopant in order to form a heavily doped silicide layer.

14. The method of claim 13, wherein oxidizing the silicide layer includes using a plasma anodization process in an oxygen plasma in order to form a passivating layer for hermetic sealing of the number of multilayer Copper metal lines and to add mechanical strength to the number of multilayer Copper metal lines.

15. The method of claim 12, wherein the method further includes depositing a layer of Aluminum on the number of multilayer Copper metal lines subsequent to oxidizing the silicide layer.

16. The method of claim 15, wherein depositing a layer of Aluminum includes depositing a layer of Aluminum using a low pressure chemical vapor deposition process (LPCVD) and forming Aluminum films from trimethylamine complexes of alane as precursors at temperatures of approximately 180 degrees Celsius in a hot walled system.

17. The method of claim 15, wherein the method further includes partially converting the Aluminum layer to Aluminum oxide by oxidation in an oxygen-containing ambient.

18. The method of claim 12, wherein the method further includes depositing a metal layer selected from the group consisting of Chromium, Titanium, and Zirconium on the number of multilayer Copper metal lines subsequent to oxidizing the silicide layer.

19. A method for forming multilayer wiring interconnects in an integrated circuit assembly, comprising:

forming a number of multilayer Copper metal lines separated by a number of air gaps above a substrate;

forming a silicide layer on the number of multilayer Copper metal lines;

oxidizing the silicide layer;

depositing a layer of Aluminum on the oxidized silicide layer. and

depositing a low dielectric constant insulator to fill a number of interstices between the number of multilayer Copper metal lines.

20. The method of claim 19, wherein forming a silicide layer on the number of multilayer metal lines includes using a pyrolysis of silane at a temperature of between 300 and 500 degrees Celsius.

21. The method of claim 19, wherein oxidizing the silicide layer includes using a plasma anodization process in an oxygen plasma in order to form a passivating layer for hermetic sealing of the number of multilayer Copper metal lines and to add mechanical strength to the number of multilayer Copper metal lines.

22. The method of claim 19, wherein depositing a layer of Aluminum includes depositing a layer of Aluminum using a low pressure chemical vapor deposition process (LPCVD) and forming Aluminum films from trimethylamine complexes of alane as precursors at temperatures of approximately 180 degrees Celsius in a hot walled system.

23. The method of claim 19, wherein the method further includes converting the Aluminum layer to Aluminum oxide by oxidation in an oxygen-containing ambient.

24. The method of claim 23, wherein the method further includes thermally oxidizing the Aluminum layer at approximately 100 degrees Celsius in one atmosphere of oxygen to form a passivating layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å).

25. The method of claim 19, wherein oxidizing the silicide layer includes a low temperature oxidation process using a magnetically excited plasma oxidation process.

26. A method for forming multilayer wiring interconnects in an integrated circuit assembly, comprising:

forming a number of multilayer Copper metal lines separated by a number of air gaps above a substrate;

forming a silicide layer on the number of multilayer Copper metal lines;

nitriding the silicide layer;

depositing a layer of Aluminum on the oxidized silicide layer. and

depositing a low dielectric constant insulator to fill a number of interstices between the number of multilayer Copper metal lines.

27. The method of claim 26, wherein forming a silicide layer on the number of multilayer metal lines includes using a pyrolysis of silane at a temperature of between 300 and 500 degrees Celsius.

28. The method of claim 26, wherein nitriding the silicide layer includes reacting an N_2 or NH_3 plasma with the silicide layer at temperatures below 200 degrees Celsius in order to form a thin layer of silicon nitride Si_3N_4 having a thickness between 50 and 200 Angstroms (Å).

29. The method of claim 26, wherein depositing a layer of Aluminum includes depositing a layer of Aluminum using a low pressure chemical vapor deposition process (LPCVD) and forming Aluminum films from trimethylamine complexes of alane as precursors at temperatures of approximately 180 degrees Celsius in a hot walled system.

30. The method of claim 26, wherein the method further includes converting the Aluminum layer to Aluminum oxide by oxidation in an oxygen-containing ambient.

31. The method of claim 30, wherein the method further includes thermally oxidizing the Aluminum layer at approximately 100 degrees Celsius in one atmosphere of oxygen to form a passivating layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å).

32. The method of claim 26, wherein forming a number of multilayer Copper metal lines above a substrate includes forming the number of multilayer Copper metal lines using electroless plating.

33. A method, comprising:

forming a metal line air-bridge structure from a number of multilayer metal lines that connect to a number of silicon devices in a substrate;

covering exposed surfaces of the air-bridge structure with a silicide layer;

hermetically sealing the underlying metal lines with an oxide layer on the silicide layer and the silicide layer; and

forming a a low dielectric constant insulator in the number of interstices.

34. The method of claim 33, wherein forming a metal line air-bridge structure includes forming the number of multilayer metal lines from a group consisting of Aluminum, Copper, Silver, and Gold.

35. The method of claim 33, wherein forming a metal line air-bridge structure includes forming a first conductor bridge level.

36. A method, comprising:

connecting a number of multilayer metal lines to a number of silicon devices in a substrate;

forming a lightly doped silicide layer on the number of multilayer metal lines;

hermetically sealing underlying metal lines with the silicide layer and an oxide layer on the silicide layer;

forming a low dielectric constant insulator in a number of interstices between the number of multilayer metal lines and the substrate; and

wherein the silicide layer on the number of multilayer metal lines.

37. A method, comprising:

forming a metal line air-bridge structure, which has having a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure connects to a number of silicon devices in a substrate;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

hermetically sealing metal lines of the air-bridge structure underlying a nitride layer on the silicide layer and the silicide layer; and

providing a low dielectric constant insulator in the number of interstices.

38. The method of claim 37, wherein forming a metal line air-bridge structure includes forming a number of multilayer metal lines from a group consisting of Aluminum, Copper, Silver, and Gold.

39. A method, comprising:

connecting a number of multilayer metal lines to a number of silicon devices in a substrate;

forming a heavily doped silicide layer on the number of multilayer metal lines;

hermetic sealing metal lines a nitride layer, which underlie the silicide layer, with nitride and silicide layers;

forming a low dielectric constant insulator in a number of interstices between the number of multilayer metal lines and the substrate.

40. A method, comprising:

forming a metal line air-bridge structure, which connects to a number of silicon devices in a substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure, with a number of multilayer Copper lines;

a silicide layer covering the exposed surfaces of the air-bridge structure with a silicide layer;

forming an oxide layer on the silicide layer overlying the metal lines so as to hermetically seal the underlying metal lines;

forming a metal layer on the oxide layer; and

forming a low dielectric constant insulator in the number of interstices.

41. The method of claim 40, wherein forming a metal line air-bridge structure includes forming a metal layer selected from the group consisting of Aluminum, Chromium, Titanium, and Zirconium.

42. The method of claim 41, wherein forming a metal layer includes forming a layer of Aluminum oxide.

43. A method, comprising:

forming one or more transistors in a substrate;

forming a metal line air-bridge structure, which connects to one or more of the transistors in the substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure, from a number of multilayer Copper lines;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

hermetically sealing underlying metal lines with the silicide layer and an oxide layer on the silicide layer;

forming a layer of partially oxidized Aluminum on the oxide layer; and

forming a low dielectric constant insulator in the number of interstices.

44. The method claim 43, wherein forming a layer of partially oxidized Aluminum on the oxide layer includes preventing localized Copper corrosion in the number of multilayer Copper lines connecting to one or more of the transistors in the substrate.

45. The method of claim 43, wherein covering the exposed surfaces of the air-bridge structure with a silicide layer includes forming a polycrystalline layer at a temperature below 150 degrees Celsius using an electron cyclotron resonance plasma enhanced chemical vapor deposition process (ECR PECVD).

46. The method of claim 43, wherein forming a layer of partially oxidized Aluminum includes forming a layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å).

47. A method, comprising:

a substrate including one or more transistors;

forming a metal line air-bridge structure that connects to one or more of the transistors in the substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure from a number of multilayer Copper lines;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

forming a nitride layer on the silicide layer so as to provide a hermetic seal of the underlying metal lines;

forming a layer of partially oxidized Aluminum on the nitride layer; and

forming a low dielectric constant, first insulator in the number of interstices.

48. The method of claim 47, wherein forming the nitride layer includes forming a thin layer of silicon nitride Si_3N_4 having a thickness between 50 and 200 Angstroms (Å) formed at temperatures below 200 degrees Celsius.

49. The method of claim 47, wherein forming a layer of partially oxidized Aluminum includes a passivating layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å) formed at approximately 100 degrees Celsius in one atmosphere of oxygen.

50. The method of claim 47, wherein forming a metal line air-bridge structure from a number of multilayer Copper lines includes electroless plating the multilayer Copper lines and forming a second insulator layer on the first insulator layer in the number of interstices.

51. The method of claim 50, wherein forming the first insulator layer includes:

forming a silicide layer on the number of multilayer Copper lines; and

forming an oxide layer on the silicide layer so as to hermetically seal of the underlying metal lines.

52. The method of claim 50, wherein forming first insulator layer includes:

forming a silicide layer on the number of multilayer Copper lines; and

forming a nitride layer on the silicide layer such that the nitride and silicide layers provide a hermetic seal of the underlying metal lines.

53. The method of claim 50, wherein forming a metal line air-bridge structure from a number of multilayer Copper lines includes forming a metal layer on the first insulator layer.

54. The method of claim 53, wherein forming a metal layer includes forming a layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å).

55. The system of claim 53, wherein forming a metal layer includes forming a metal layer selected from the group consisting of Aluminum, Chromium, Titanium, and Zirconium.

56. A method, comprising:

providing one or more transistors in a substrate;

forming, from a number of multilayer Copper lines, a metal line air-bridge structure that connects to one or more of the transistors in the substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

hermetically sealing, with an oxide layer and the silicide layer, the underlying metal lines;

forming a metal layer on the oxide layer;

forming a low dielectric constant insulator in the number of interstices; and

coupling an integrated memory circuit including the metal line air-bridge structure to a processor.

57. The method of claim 56, wherein hermetically sealing includes preventing localized Copper corrosion in the number of multilayer Copper lines connecting to one or more of the transistors in the substrate.

58. The method of claim 56, wherein covering the exposed surfaces of the air-bridge structure with a silicide layer includes forming a polycrystalline layer at a temperature below 150 degrees Celsius using an electron cyclotron resonance plasma enhanced chemical vapor deposition process (ECR PECVD).

59. The method of claim 56, wherein forming the metal layer includes forming a layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å).

60. The method of claim 56, wherein forming the metal layer includes forming a metal layer selected from the group consisting of Aluminum, Chromium, Titanium, and Zirconium.

61. A method, comprising:

forming one or more transistors on a substrate;

forming, with a number of multilayer metal lines, a metal line air-bridge structure that connects to one or more of the transistors in the substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

providing an oxide layer on the silicide layer so as to provide a hermetic seal of the underlying metal lines with the oxide and silicide layers;

forming a layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å) on the oxide layer;

forming a low dielectric constant insulator in the number of interstices; and

coupling an integrated memory circuit including the metal line air-bridge structure to a processor.

62. The method of claim 61, wherein forming, with a number of multilayer metal lines, a metal line air-bridge structure includes forming a number of multilayer metal lines selected from the group consisting of Aluminum, Copper, Silver, and Gold.

63. The method of claim 61, wherein forming a low dielectric constant insulator includes forming a polyimide layer.

64. The method of claim 63, wherein forming the polyimide layer includes forming a foamed polyimide layer.

65. A method, comprising:

forming one or more transistors on a substrate;

connecting a number of multilayer metal lines to one or more of the transistors in the substrate;

forming a lightly doped silicide layer on the number of multilayer metal lines;

forming an oxide layer on the silicide layer so as to hermetically seal the underlying metal lines;

forming a layer of Al_2O_3 having a thickness of approximately 20 Angstroms (Å) on the oxide layer;

forming a low dielectric constant insulator in a number of interstices between the number of multilayer metal lines and the substrate; and

coupling an integrated memory circuit including the metal line air-bridge structure to a processor.

66. The method of claim 65, wherein connecting the number of multilayer metal lines connecting to one or more transistors in the substrate includes forming a first conductor bridge level.

67. A method, comprising:

forming, from a number of multilayer metal lines, a metal line air-bridge structure that connects to a number of silicon devices in a substrate has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

hermetically sealing the underlying metal lines with the silicide layer and an oxide layer on the silicide layer; and

substantially filling the number of interstices with a low dielectric constant insulator.

68. A method, comprising:

forming, from a number of multilayer metal lines, a metal line air-bridge structure that connects to a number of silicon devices in a substrate has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

covering the exposed surfaces of the air-bridge structure with a silicide layer;

forming an oxide layer converted from and located on the silicide layer so as to provide a hermetic seal of the underlying metal lines; and

forming a low dielectric constant insulator in the number of interstices.

69. A method, comprising:

forming, from a number of multilayer metal lines, a metal line air-bridge structure that connects to a number of silicon devices in a substrate has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

providing a silicide layer covering the exposed surfaces of the air-bridge structure;

forming a nitride layer on the silicide layer wherein the nitride and silicide layers provide a hermetic seal of the underlying metal lines; and

substantially filling the number of interstices with a low dielectric constant insulator .

70. A method, comprising:

forming, from a number of multilayer metal lines, a metal line air-bridge structure that connects to a number of silicon devices in a substrate has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

providing a silicide layer covering the exposed surfaces of the air-bridge structure;

forming a nitride layer converted from and located on the silicide layer wherein the nitride and silicide layers provide a hermetic seal of the underlying metal lines; and

forming a low dielectric constant insulator in the number of interstices.

71. A method, comprising:

forming, with a number of multilayer Copper lines, a metal line air-bridge structure that connects to a number of silicon devices in a substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

forming a silicide layer covering the exposed surfaces of the air-bridge structure;

forming an oxide layer on the silicide layer wherein the oxide and silicide layers provide a hermetic seal of the underlying metal lines;

forming a metal layer on the oxide layer; and

substantially filling the number of interstices with a low dielectric constant insulator.

72. A method, comprising:

forming, with a number of multilayer Copper lines, a metal line air-bridge structure that connects to a number of silicon devices in a substrate and has a number of top, bottom, and side exposed surfaces adjacent to a number of interstices in the air-bridge structure;

forming a silicide layer covering the exposed surfaces of the air-bridge structure;

forming an oxide layer converted from and located on the silicide layer wherein the oxide and silicide layers provide a hermetic seal of the underlying metal lines;

forming a metal layer on the oxide layer; and

forming a low dielectric constant insulator in the number of interstices.